MATHville

Courseware Solutions

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Mathville™ Kidway v. 1.0

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Getting started

✧✧

Insert the CD-ROM into the CD-ROM drive.

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Windows 3.x

a) Using the File Manager, click the CD-ROM drive icon.
b) Double-click ***kidway3.exe*** to start.

✧✧

Windows 95

a) Choose ***My Computer***.
b) Choose the CD-ROM drive icon.
c) Double-click the ***Kidway*** icon to start.

✧✧

Macintosh

a) Double-click the ***Mathville Kidway CD*** icon to show the contents of the CD-ROM.
b) Double-click the ***Mathville Kidway*** icon to start.

✧✧

Introducing Mathville™ Kidway

Mathville Kidway is part of the Mathville™ series of educational software, which is based upon the belief that EVERY student can enjoy developing and demonstrating their mathematical literacy within a supportive, mathematically rich environment. The Mathville series is used in thousands of schools and is recommended by many departments and boards of education. The programs are designed in accordance with the standards developed by the National Council of Teachers of Mathematics.

Structure & content

Mathville Kidway is a virtual midway where traditional games of skill and chance are transformed into math activities. There are 8 games on the Kidway. Children are free to explore any of the games at any time and to choose difficulty levels within each game. More detailed descriptions begin on page 6.

Suggested grade range

The topics in Mathville Kidway are often introduced by the end of grade 1. Due to its structure, which makes it easy to leave activities or levels that are too easy or difficult, the program may be used in kindergarten to grade 2 and may be enjoyed by younger children as well.

Recommendations for use

Most children readily begin exploring Mathville Kidway on their own, require little supervision and enjoy playing for an hour or more. Typically students will play four or five different games at the default Level 1, or easiest level, requiring several sessions to see all of the games and begin trying higher levels. As students acquire new skills or advance to higher grades, they can revisit the Kidway, discovering new challenges in the more expert levels. The program is appropriate for use at any point during the school year and may be used as:

- a highly motivating way to reinforce and provide additional practice in math skills introduced in class
- a means of providing a wide variety of applications of math skills and concepts
- a source of assessment information about a student's problem-solving methods and styles and a diagnostic tool to determine topics of difficulty
- an enrichment activity for children who excel in math

Having small groups of two to five students use the program works well, creating a setting which encourages the development of communication skills and co-operative problem solving. See page 7 for additional tips for play.

Tracking student progress

Each Mathville Kidway activity includes a printable record of achievement. If the program is used on an individual basis, these certificates provide a "paper track" of student progress, providing evidence that students have demonstrated the learning outcomes associated with each activity and level.

Copying to a hard drive

Mathville Kidway was developed to run directly from the CD-ROM. However, if you wish to copy it to a hard drive and run it, you require the following files and folders which occupy about 27 MB:

Windows 95

- *Kidway.exe*
- *WINDATA* folder

Macintosh

- *Mathville Kidway*
- *DATA* folder

Windows 3.x

- *kidway3.exe*
- *WINDATA* folder

Math Topics in Mathville Kidway

Number Sense

Addition ..... *Baseball Count*
Duck Pond
Leap Frog
Snack Shack
Comparing sets of objects ..... *Pick a Winner*
Test Your Graph Strength
Counting ..... *Baseball Count*
Test Your Graph Strength
Pick a Winner
Snack Shack
Counting by 2s, 5s & 10s ..... *Snack Shack*
Fractions (halves) ..... *Pick a Winner*
Fractions (halves, quarters) ..... *Snack Shack*
Multiplication as repeated addition ..... *Snack Shack*
Number facts ..... *Duck Pond*
Reading numerals & number words ..... *Baseball Count*
Snack Shack
Subtraction ..... *Duck Pond*

Geometry & Spatial Sense

Congruence ..... *Bingo*
Flips ..... *Pick a Winner*
Test Your Graph Strength
Shape position words like left, right, up, down ..... *Pick a Winner*
Shape words like big, little, round, etc. ..... *Test Your Graph Strength*
Symmetry ..... *Pick a Winner*
Test Your Graph Strength
Three-dimensional objects ..... *Bingo*
Test Your Graph Strength

Two-dimensional shapes ..... *Bingo*
Pick a Winner
Test Your Graph Strength

Measurement

Comparing objects by length & height ..... *Pick a Winner*
Test Your Graph Strength
Comparing objects by mass or weight ..... *Test Your Graph Strength*
Comparing by area (non-standard covers) ..... *Test Your Graph Strength*
Days of the week ..... *Pick a Winner*
Sequencing events ..... *Rides*
Time ..... *Rides*
Volume words such as full & empty ..... *Snack Shack*

Patterns & Relations

Extending patterns ..... *Leap Frog*
Pick a Winner
Identifying attributes in presorted sets ..... *Pick a Winner*
Relating numerical & geometric patterns ..... *Pick a Winner*
Skip counting ..... *Snack Shack*
Sorting by attributes ..... *Test Your Graph Strength*

Data & Probability

Collecting & recording data ..... *Test Your Graph Strength*
Comparing data in two categories ..... *Test Your Graph Strength*
Bar graphs ..... *Test Your Graph Strength*
Concrete object graphs ..... *Test Your Graph Strength*
Pictographs ..... *Test Your Graph Strength*
Probability experiments ..... *Test Your Graph Strength*

Problem Solving

Throughout the program

Mathville Kidway Main Screen

- To play one of the eight Kidway games, click on its symbol around the perimeter of the ferris wheel. In the following pages each game is described in detail.
- To return to this main screen, click the Return to Kidway button in each game.

- Click the pull-down File menu on the Menu Bar across the top of the screen and you'll see four options:

  Credits – for a list of the creators of Mathville Kidway

  Print Kidway – to print the Main Screen on your printer

Sound – to display the slider control that adjusts the sound volume, and

Quit – to exit from Mathville Kidway.

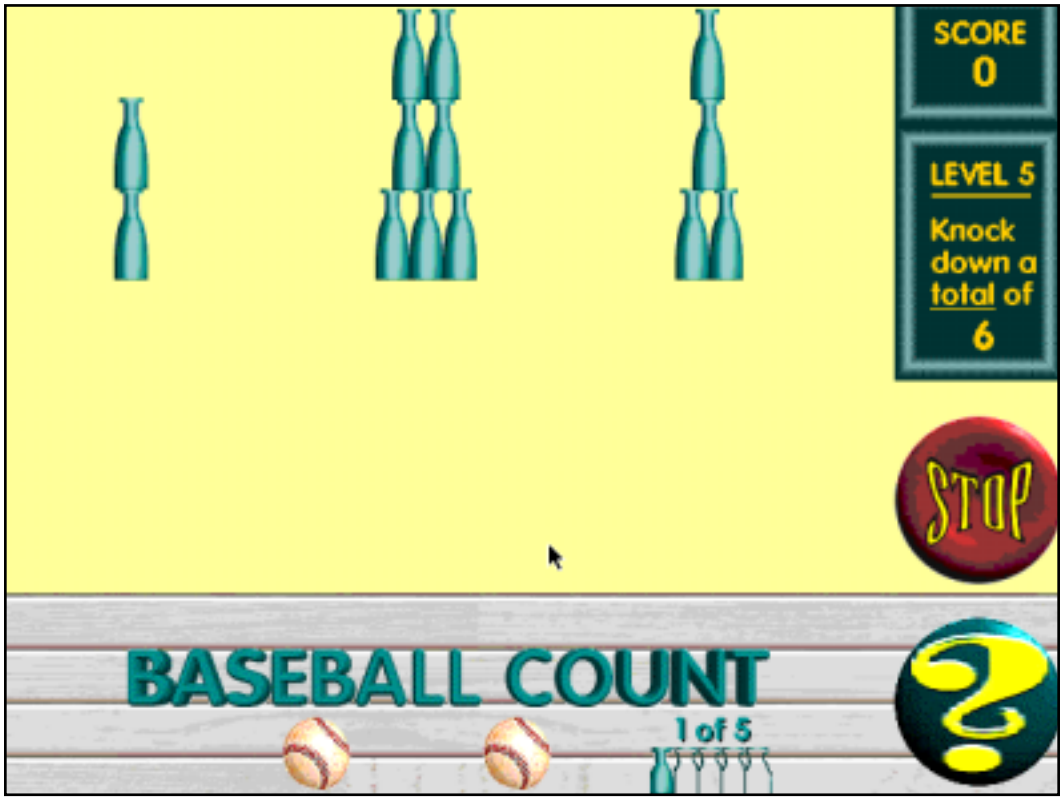
When finished with Credits or Sound, you'll probably want to close the window (click in the upper corner) to make it disappear.

These pull-down menu options are of interest primarily to the teacher or supervising adult as they are generally not needed while playing the games.

General Tips for Play

- It's probably best for an adult to start the program (see the back cover of this manual) and stop it (by choosing Quit from the pull-down File menu and ejecting the CD-ROM).
- Children who are familiar with computers in the classroom generally discover a lot about Mathville Kidway by following their natural inclinations to play and explore. Encourage children to answer their own "What do I do next?" or "How do I…"-type questions by looking at the screen and experimenting. Point out that trying as many things as they can think of and then seeing what happens is a good way to solve a problem.
- Having small groups of students work together on the program works very well, providing a setting for cooperative play and problem-solving. One way of doing this is to set up a computer running Kidway as a resource or activity centre.
- The default setting for the games is Level 1. If students seem unaware that there are other levels you might want to show them how to select Level 2.
- Most of the games end with a congratulatory screen with two buttons, Done and Print. If you do not have a printer, a message to that effect appears if Print is chosen. You may wish to explain to students that Done should be chosen unless a printer is available.

Baseball Count



- The object of Baseball Count is to knock down stacks of bottles with baseballs. To throw a baseball, drag it (move the pointer over a baseball, then keep the mouse button down while moving the mouse) to the top edge of the wooden fence and release the mouse button. The ball is then "thrown" in a straight line.
- Baseball Count has 8 levels:

Level	Knock over	To score
1	Any stack (a warm-up to get used to throwing the ball)	1 point
2	x bottles with 1 ball, where x is a numeral from 1 - 9	2 points
3	Like level 2, but x is a number WORD	3 points

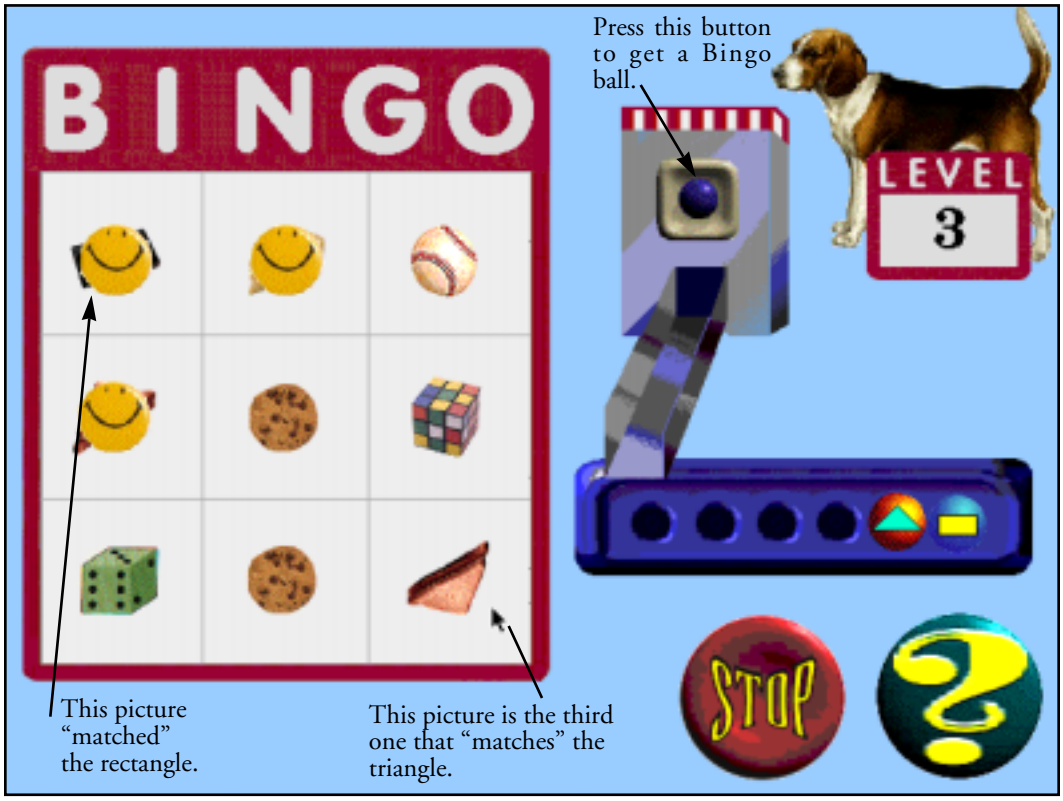
Baseball Count Learning Outcomes

Read numerals to 29
Read number words to eighteen
Add to 29 using manipulatives & diagrams

4	The stack with the greatest number of bottles	4 points
5	A total of x with 2 balls, where x is a numeral from 1-9	5 points
6	A total of x with 2 balls, where x is a numeral from 10-18	6 points
7	Like level 6, but x is a number WORD	7 points
8	A total of x with 2 balls, where x is a numeral from 20-29	8 points

- To <u>choose a level</u>: on the opening Baseball Count screen, drag the ball to the two-bottle stack for Level 2, the three-bottle stack for Level 3, etc.
- The "1 of 5"-type diagram under the word Count keeps track of the number of turns. After 5 turns the game ends and there is a chance to print the score and level or return to the opening level-choosing screen.
- If observation or the printouts indicate that children are using only Level 1, check that they understand that there are higher levels and how to get to them.
- Children often choose Level 8 and stop when they find the problems too difficult. This is a good opportunity to point out that it's a good idea to go back to a simpler problem and work your way up step by step. In this instance, if Level 8 is too hard and you were good at Level 1, try Level 2 next, then 3, and by the time you work your way back to Level 8 it may not seem as hard.
- Observing or asking students to describe how they are solving the problem is useful for assessing counting skills, concept of addition, recall of addition facts and ability to apply addition facts in a problem-solving context. For students who know their addition facts and are counting to solve the problems in Levels 5-8, Baseball Count is a good opportunity to stress the connection between number facts and real-life applications. Applying skip counting when counting the larger stacks of bottles in Levels 6-8 is another application example that you may wish to point out.

Bingo



- After selecting a level, which is accomplished by dragging the happy face to a number on the bingo card, a player begins a round of Bingo by clicking on the blue button to get a Bingo ball to roll out. Then, all of the squares on the Bingo card that "match" the shape on the ball must be selected. BINGO is attained when any row, column, or diagonal on the card is completely marked. There are no penalties for incorrect guesses, and the player is told if a match is missed.

- Bingo has eight levels of difficulty and one two-player game. The levels vary both in the number of squares on the bingo card and in the complexity of matching the 2-dimensional figure on the ball with the figures or objects on the card.

Bingo Learning Outcomes

Identify 2- and 3-dimensional figures

Recognize the relationship between 2- and 3-dimensional figures

Recognize geometric shapes in everyday objects

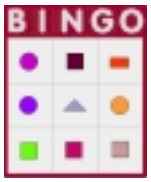
Recognize congruent shapes

☼ In levels 1, 2 and 3, the shapes are limited to a triangle, a rectangle, a square and a circle. In level 1, the colors of the shapes on the card are exactly the same as the color of the shapes on the bingo balls. In level 3, the figures on the bingo card are replaced by 3-dimensional objects which correspond to the 2-dimensional shapes on the balls.

In level 4, the number of possible shapes expands to six and includes a rhombus and a trapezoid. In level 5, 3-dimensional objects reappear, but this time on a 5 by 5 bingo card. In level 6, the shape collection is expanded to include an ellipse. In levels 7 and 8, the figures on the card may be flipped or turned and in level 8 the shapes may be resized as well.

The bingo cards are randomly generated at each round. Below are examples of cards at each of the eight levels:

LEVEL 1



LEVEL 2

LEVEL 3

LEVEL 4

The 2-player game is equivalent to level 4 in difficulty.

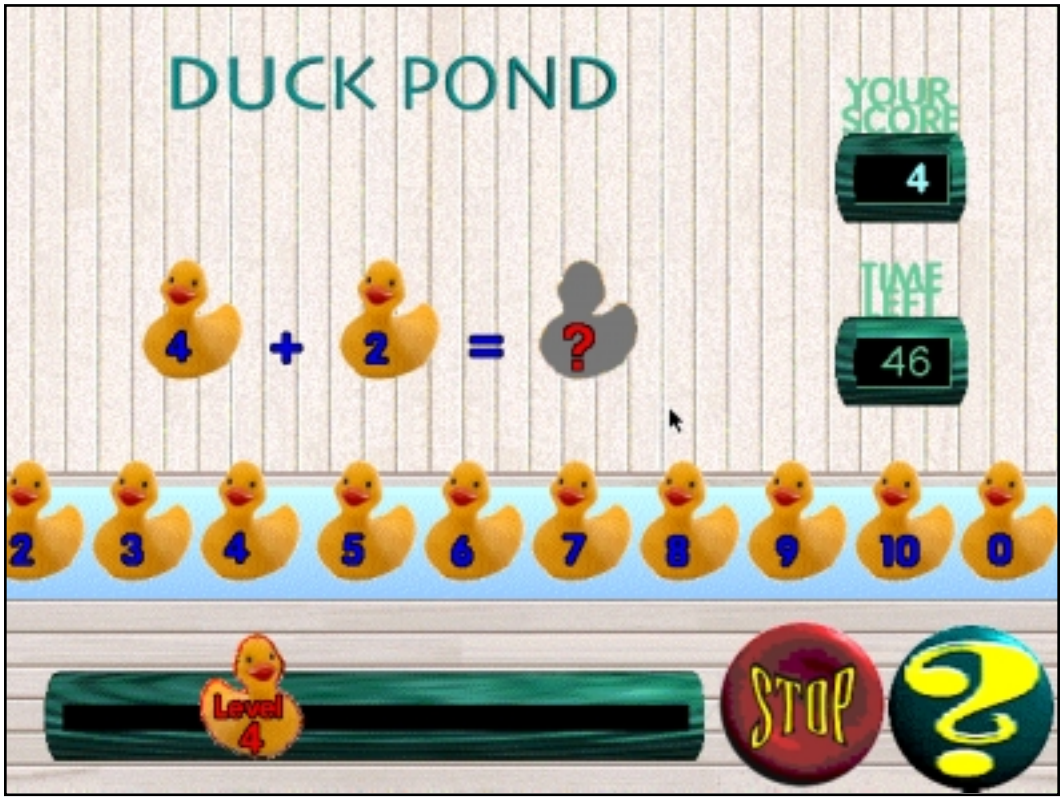
LEVEL 5

LEVEL 6

LEVEL 7

LEVEL 8

Duck Pond



- Duck Pond is designed to help motivate students and provide additional practice while they are learning their addition and subtraction facts. The object is to answer a randomly generated addition or subtraction problem by clicking on a numbered duck as it moves across the middle of the screen.
- Duck Pond has 10 levels. Unless otherwise noted, problems are in horizontal format and the swimming ducks are in order from 0 to 10:

Level	Type of problem presented	Correct answer reward
1	x + 1 where x is between 0 and 9, vertical format	1 point

Duck Pond Learning Outcomes

Recall addition and subtraction facts to 10
Add a number from 1-10 to 10

2	x + 1 where x is between 0 and 9	2 points
3	x + 2 where x is between 0 and 8	3 points
4	x + y, x between 0 and 5, y between 0 and 4	4 points
5	x + y, x between 0 and 9, sum is 10 or less, moving ducks are in random order	5 points
6	x – 1 where x is between 1 and 10	6 points
7	x – 2 where x is between 2 and 10	7 points
8	x – y where x is between 1 and 10, x ≥ y, moving ducks are in random order	8 points
9	A random choice from Level 5 or 8	9 points
10	10 + x, x between 0 and 10, moving ducks numbered from 10 to 20 are in random order	10 points

- To choose a level: on the opening Duck Pond screen, drag the Level indictor duck (bottom left) to the left or right.
- If a player chooses the wrong duck, the duck returns to the pond, and the player can try another duck.
- Although players may stop at any time, there is a 60 second time limit. When the game ends, a certificate is presented showing the level and total points earned. The certificate may be printed and kept as a record of the student's mastery of addition or subtraction facts at a particular level of difficulty.

Leap Frog

- The object of Leap Frog is to move the frog to the winner's circle (in the example above, to position 4). The frog always begins at position 0.
- To move the frog, drag one of the rocks in the bottom left of the screen to the lily pad occupied by the frog. The +2 rock causes the frog to leap forward 2 positions (for example, from lily pad 0 to lily pad 2) and the +1 rock moves the frog forward 1 position.

  Although children may need some time to figure out how to make the frog leap, once over this initial challenge they are typically very successful at winning games regardless of level.

Leap Frog Learning Outcomes

Represent addition through manipulating objects

Problem-solving (logical reasoning, working backwards, recognizing and extending patterns)

- If the student moves the frog beyond the winner's circle, for example if the frog is on lily pad 3 and the +2 rock is dragged to the pad, the frog splashes into the pond and the student loses that round.
- Level 1 is a warm-up allowing the player to experiment with moving the frog and seeing that winning involves moving the frog to the winner's circle. Unlike the other levels, Level 1 is a solitaire game, where every move is made by the student.
- In Levels 2 through 8, the student plays against the computer, with the computer and the student taking turns moving the frog. In Level 2, the winner's circle is position 3, in Level 3 position 4 (see example), in Level 4 position 5, etc.
- The student goes first in cases where going first and correct strategic play lead to a win, and the computer goes first when going second and correct strategic play lead to a win. The student, therefore, can always win.
- If the student wins against the computer, the winning position screen may be printed, providing a paper record of the student's achievement.
- To <u>choose a level</u>: on the opening Leap Frog screen, drag a rock to move the frog to lily pad 2 for Level 2, to lily pad 3 for Level 3, etc.
- Asking students who have just won a game to demonstrate how they won will focus attention on their problem-solving strategies. Encouraging small groups to work together on a game, discussing which moves are best and why, also helps to focus attention on strategies. Discussion point: Do you always win? Is there somebody else who always wins, too? Are your winning moves the same?
- Spending some time discussing Level 2 and then moving on to Level 3 may also help students to see that working backwards can be combined with being able to solve a simpler form of a problem to produce a winning strategy.

Pick a Winner

- In Pick a Winner, a set of objects is displayed and the student must pick the one that satisfies a given description. In the example above, the student must pick the shortest of the four animals shown.
- To pick one of the objects, the Left, Right, Up and Down buttons are held down to move the crane until its hook is over the object. When the PICK button is clicked, the object drops out of the display and lands on the Winner platform.
- Each time an object is picked, it counts as one turn. Each game consists of 5 turns which are kept track of by the five-segment fuel tank display just above the STOP button.

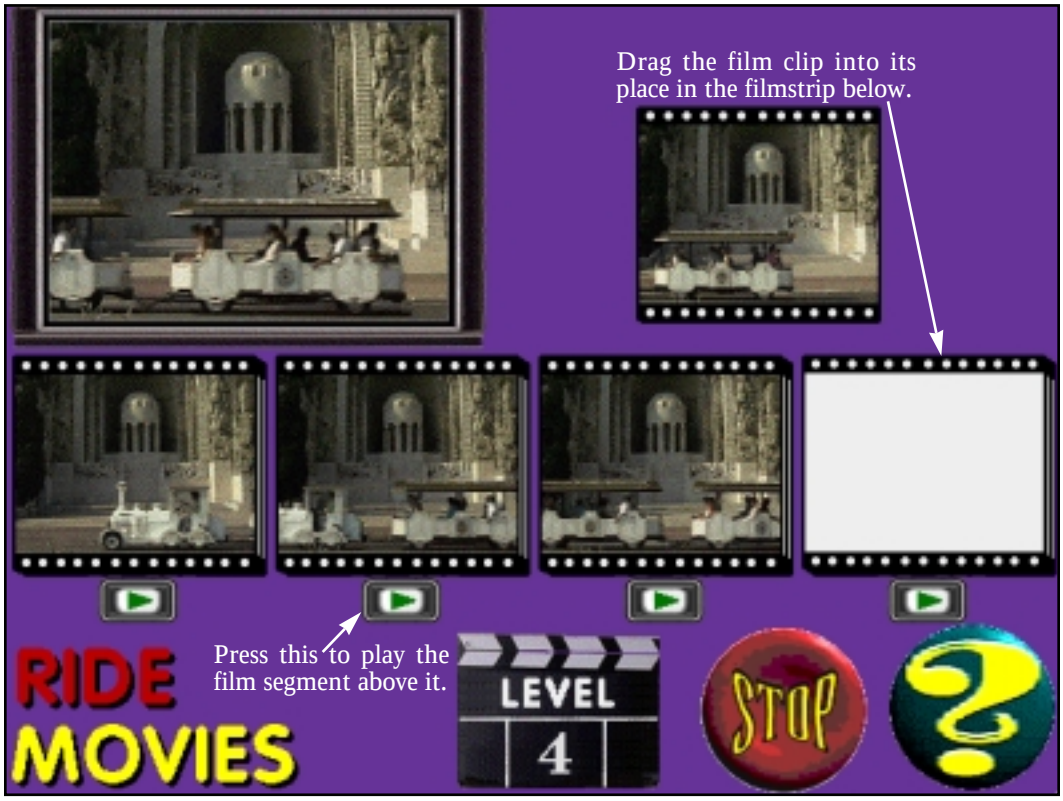
Pick a Winner Learning Outcomes

Extend numerical & non-numerical patterns
Name in order the days of the week
Demonstrate an understanding of halves
Compare, sort & classify 2 and 3-D shapes
Explore informally symmetry, reflections & rotations
Identify attributes & rules in presorted sets
Describe the relative positions of 2-D shapes using terms such as left, right, up & down

- When a correct object is picked, the score increases by 1. If the object picked does not satisfy the description, it bounces back into the display case, and the student can pick another object.
- To <u>choose a level</u>: on the opening screen, use the Left and Right buttons to move the crane hook over the desired level numeral, then press PICK.
- Pick a Winner has 8 levels:

<u>Level</u>	<u>Type of Description: Pick the…</u>
1	tallest, shortest, longest of a set of everyday items or geometric shapes
2	next in sequences such as abab…, aabaab…, abbabb…, abcabc…, abcbabcba…, aabbaabb…, abbcccdddd…
3	different item in a set such as balls & a fruit, everyday spheres & a banana, yellow everyday items & an orange, triangles & a rectangle, quadrilaterals & a triangle, polygons & a circle, rectangles & a trapezoid, sets of x objects & a set of y objects, cones & a cylinder or vice versa, cylinders or cones & a rectangular solid or vice versa
4	next in sequences such as sets of x, 2x, 3x items where x is 1-5; 1, 3, 6 items in triangular arrays; even, odd or descending numerals
5	next in a pair where the other pairs are all wholes & halves
6	next following a sequence of 3 rotations of an object or shape
7	next in a pair where the other pairs are all reflections
8	next in sequences such as days of the week, triangular arrays, square arrays, other visual patterns such as expanding squares or crosses

Rides


Drag the film clip into its place in the filmstrip below.
Press this to play the film segment above it.
RIDE MOVIES
LEVEL
4
STOP

- The challenge for children in this activity is to correctly sequence three or four slides or film clips to create a movie or slide show.
- The activity is very open ended and has been designed to encourage experimentation and exploration. The activity begins with the presentation of three slides or film clips (four in level 4) which the child must drag into position in the film strip or slide show. As soon as all of the clips or slides have been placed in slots, the movie or slide show may be viewed, regardless of whether the sequential order is correct or not. Individual film clips or slides can be moved around without limit and each movie or slide show can be viewed as many times as desired.

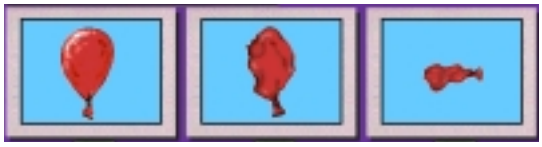
Rides Learning Outcomes

Demonstrate the awareness of event sequencing

Recognize the passage of time using a clock

Use experimentation, interpolation and other problem solving techniques to solve a real life sequencing problem

- Each slide or film segment can be viewed independently by clicking the play button beneath its slot. There is no sound when individual film segments are played.
- There are four levels of difficulty in this activity. Level 1 presents three graphically simple slides with an easily recognizable sequence of events. Some examples of these are: a balloon bursting (shown below), a clock showing time passing, a printer printing. Level 2 presents the same sequences, but as moving picture segments instead of still frames. In levels 3 and 4, the child works with real videos of midway rides.



- When the slide show or movie is in the correct sequence, positive feedback is given, as well as the opportunity to print out the screen.
- Children should be encouraged to show others the shows they have created and to explain their sequencing of the film clips or slides. The activity has been designed so that even children with minimal understanding of sequencing and interpolating events can have fun by creating their own shows.

Snack Shack

- At the Snack Shack players must fill the food order presented on the board. A round at the Snack Shack consists of three orders, each represented by a balloon in the upper right corner. At the end of a round, a print option is made available.
- Food items are selected from the upper shelf by a single click of the mouse. The food item then drops through the order door onto the lower shelf. Players are immediately notified if an incorrect item is selected. When an order is complete, the items are checked, placed on a tray, positive feedback is given, and the next order is presented. In the example above, the order will be complete after another glass of milk is selected.

Snack Shack Learning Outcomes

Count out the number of objects in a set
Read numerals and number words to 10
Demonstrate multiplication as repeated addition
Count by 1s, 2s, 3s, 5s and 10s
Use the words "full" and "empty" in reference to volume
Demonstrate an understanding of halves and quarters as part of a shape or object.

☼ There are eight levels in Snack Shack, each covering skills in number concepts, number operations and measurement:

Level	Description and examples
1	Single type of food per order; numerals to 10; audio version of order available. Example: 5 bags of popcorn
2	Three types of food per order; numerals to 10; no audio order. Example: 2 hot dogs, 5 orders of fries, 4 glasses of milk
3	Three types of food per order; number words to 10; audio version of order available. Example: five orders of fries, two sundaes, three glasses of milk (see opposite page)
4	Three types of food per order; number words to 10; no audio order. Example: two apples, three bananas, four fruit drinks
5	Two types of food per order; halves, quarters, full, empty; audio version available. Example: one half of a pizza, one quarter of a sandwich
6	Single type of food per order; multiplication as repeated addition; audio version of order available. Example: 4 people each want 2 hot dogs
7	Three types of food per order; multiples of 2, 3, 5, 10; no audio order. Example: 25 jelly beans (groups of 5), 6 bananas (in 3s), 40 grapes (in 10s)
8	Two types of food per order; multiplication as repeated addition; audio version available. Example: 2 people each want 2 apples and 3 cookies

☼ The Snack Shack activities can be used to reinforce reading skills as well as math skills and can easily be extended to many off-computer classroom activities.

Test Your Graph Strength

- The object of Test Your Graph Strength is to choose (or click on) the hammer at the base of the graph that will be higher when data are graphed. One point is scored when the correct hammer is chosen. After 5 graphs there is a chance to print the score and level or return to the opening level-choosing screen.
- Test Your Graph Strength has 8 levels:

Level	Graph & data types
1	Object graphs of two sets of 1 to 6 everyday items or geometric shapes (see above) grouped in two easily countable sets

Test Your Strength Learning Outcomes

Explore object graphs, pictographs & bar graphs
Sort, classify & count elements of a set
Identify, compare, sort & classify 2 and 3-D shapes
Classify & compare objects by length, height & mass
Collect, record & organize first-hand information
Conduct simple probability experiments

2 Like Level 1 but the items are in two "messy" piles that must be rearranged (by dragging the items) for accurate counting

3 Pictographs of two sets of 1 to 6 everyday items or geometric shapes that must be sorted and rearranged for counting. Discussion point: why are pictures used for the graph instead of real objects as in Levels 2 and 3?

4 Graphs of accumulated rectangles with a vertical scale, of 2 to 11 everyday items or geometric shapes that fall into two categories, requiring categorizing, sorting and rearranging for counting.

5 Graphs like Level 4 with 2 to 11 data that must be collected and recorded for counting. For example, the baseline labels are "YES votes" and "NO votes" and to the right are 9 figures of people. When a figure is clicked it says "Yes" or "No" and students must collect and record the data.

6 Bar graphs with continuous bars and vertical scales. Data is similar to Level 5, but measurement skills are required. For example, the baseline labels might be "Lighter than a buffalo" and "Heavier than a buffalo" and several animals and a buffalo on a seesaw are shown. To collect the data, animals must be dragged to the seesaw, and if the buffalo's side rises, the animal is recorded as being heavier.

7 Like Level 6, but the data are the results of the student's clicking the arrow on a spinner 5 times. After each spin a small colored arrow appears reflecting the result.

8 Like Level 7, but students must record the spin results themselves.

✲ Test of Strength works well with other classroom graphing and probability activities, such as graphing spinner experiments or survey results.

Troubleshooting

Problem	*Possible Cause*	*Possible Solution*
PERFORMANCE - Windows		
Program seems slow Program freezes	• not enough memory (at least 8 MB is required)	• Don't run other programs while running *Kidway*
General Protection Fault error	• memory management error	• Exit Windows and restart the computer • Run SCANDISK to detect and fix any memory location errors
PERFORMANCE - Macintosh		
Program seems slow Program freezes	• not enough memory (at least 8 MB is required)	• Don't run other programs while running *Kidway* • Turn OFF background printing • Close all windows in the Finder • Turn OFF modern memory or 32-bit addressing
PRINTING		
Page doesn't print	• printer driver not installed or active • printer not properly connected • printer not selected under *Print Manager*	• Refer to your printer and Windows manuals
Printing is slow	• slow processor	• Don't use *Kidway* while the printing is processing